

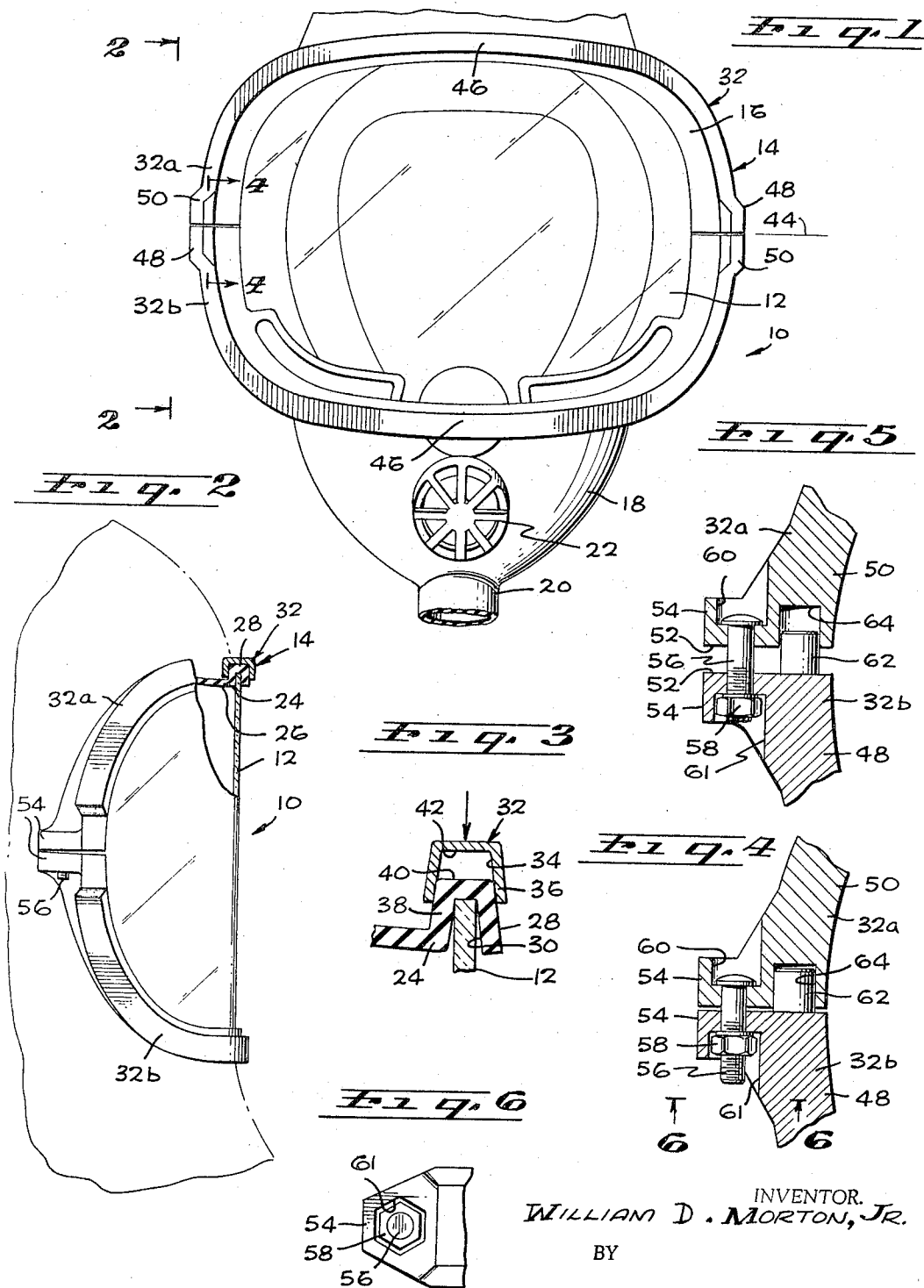
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RETAINING MEANS FOR FACE MASKS

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RETAINING MEANS FOR FACE MASKS

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This invention relates generally to face masks and more particularly to improvements in lens retaining means for face masks.

Modern face masks are made in a variety of types and for use in widely differing environments. With regard to type, for example, some face masks are designed to be worn by themselves, while other face masks are intended to be worn in conjunction with, or are constructed as an integral part of an oxygen mask or helmet. With regard to environment, some masks are designed for use in a pressurized medium, such as under water, others for use in a rarefied atmosphere, such as at high altitudes or in outer space, and yet others for use at normal atmospheric pressure in a noxious, or otherwise harmful atmosphere. All face masks, however, are basically similar in that each includes a face or head enclosure with a front opening through which the wearer may look, a transparent face plate or lens within this opening, and retaining means for mounting the lens in the opening and forming a fluid-tight seal between the enclosure and the lens.

This invention is concerned primarily with improving such lens retaining means. As will be evident from the later description, the improved lens retaining means of the invention may be used to advantage in some, if not all, of the different types of face masks mentioned above. The improved retaining means is particularly adapted, however, for use in a so-called smoke or oxygen mask, which is a breathing mask designed for use at normal atmospheric pressure, in a smoke-filled or otherwise noxious environment. For this reason, the invention will be described in connection with such a breathing mask.

To be completely practical and satisfactory, the lens retaining means of a face mask should satisfy certain requirements. First, the retaining means should provide an absolutely fluid-tight seal between the lens and its surrounding head or face enclosure. Secondly, if the lens of a face mask becomes scratched, cracked or otherwise defective, it must be replaced. Accordingly, the lens retaining means should be so constructed as to permit the lens to be quickly and easily removed and replaced without damage to the new lens and in such manner as to assure positive restoration of the fluid seal between the mask enclosure and the new lens. Thirdly, the retaining means should provide firm retention of the lens in the lens opening of the enclosure so as to preclude the possibility of accidental displacement of the lens from the opening by a pressure differential across the lens or contact of the lens with another object. Finally, the lens retaining means should be simple in construction, as well as easy to disassemble and reassemble.

A general object of the present invention is to provide an improved lens retaining means for face masks which satisfies all of the foregoing requirements.

Another object of the invention is to provide an improved lens retaining means of the character described which is particularly adapted for use in an oxygen breathing mask of the type commonly referred to as a smoke and oxygen mask.

Yet a further object of the invention is to provide an improved lens retaining means of the character described which includes certain interchangeable parts that simplify assembly of the retaining means and result in a face mask which is relatively simple in construction, economical to manufacture, and otherwise ideally suited to its intended purposes.

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With the foregoing objects in view, together with such additional objects and advantages as may subsequently appear, the invention resides in the construction, combination and arrangement of parts disclosed, by way of example, in the following detailed description of one presently preferred embodiment of the invention and in the attached drawings wherein:

FIGURE 1 is a front elevation of a smoke and oxygen mask embodying the improved face mask lens retaining means of this invention;

FIGURE 2 is a side elevation, looking in the direction of the arrows on line 2—2 in FIGURE 1, of the improved lens retaining means, with parts broken away for the sake of clarity;

FIGURE 3 is an enlarged section through the improved lens retaining means, illustrating the manner in which the retaining means is assembled;

FIGURE 4 is an enlarged section taken on line 4—4 in FIGURE 1;

FIGURE 5 is a view similar to FIGURE 4 showing the illustrated parts of the lens retaining means partially disassembled to permit removal of the face mask lens; and

FIGURE 6 is a section taken along line 6—6 in FIGURE 4.

Referring now to these drawings, there is illustrated an oxygen breathing mask 10 of the type which is commonly called a smoke and oxygen mask. This mask has a transparent face plate or lens 12 supported by improved lens retaining means 14 of this invention. Except for the improved lens retaining means 14, the breathing mask 10 is conventional and thus will not be described in great detail. Suffice it to say that the mask includes an enclosure 16 which is adapted to seat against the wearer's face in such manner as to form a substantially airtight face enclosure about the eyes, nose and mouth. The lower end of the face enclosure 16 is shaped to form a breathing chamber 18. Extending from this chamber is a flexible hose 20 for connection to a supply of oxygen or compressed air (not shown). Mounted in the wall of the chamber 18 is an exhalation valve 22.

In practice, the breathing mask 10 is equipped with straps or other suitable means (not shown) for retaining the mask in position on the wearer's face. When breathing, the wearer inhales the oxygen or compressed air which enters the breathing chamber 18 through the hose 20. The stale breath exhaled by the wearer exhausts to atmosphere through the exhalation valve 22.

The face enclosure 16 of a typical breathing mask 10 of this type comprises a wall 24 of rubber or other suitable flexible material. This wall has a front opening 26 through which the wearer may look and which is closed by the transparent lens 12. Lens 12 is retained in position in the opening 26 by the present improved lens retaining means 14. This lens retaining means includes a resilient, generally channel-shaped bead 28 which extends about the entire circumference of the lens opening 26 and has an inwardly opening channel or groove 30 receiving the edge of the lens. In the case of the illustrated breathing mask 10, the bead 28 constitutes an integral part of the face enclosure wall 24. Preferably, both the outer walls of the bead and its inner walls, that is, the side walls of groove 30, are provided with a slight "draw" or taper, as illustrated in exaggerated fashion in FIGURE 3. The width of the bead groove 30, at its narrowest part, is equal to or just slightly less than the thickness of the lens 12 to provide the latter with a snug fit in the groove. The width of the groove 30, at its widest part, is slightly greater than the thickness of the lens to facilitate insertion of the lens into the groove.

Bead 28 is encircled by a metal retainer ring 32. As may be best observed in FIGURE 3, this retainer ring is generally channel-shaped in transverse cross-section and

has an inwardly opening groove or channel 34 for receiving the bead. When installing the lens 12 in the lens opening 26, the retainer ring 32 is forced over the bead 28, as indicated by the arrow in FIGURE 3, to the position of FIGURE 2. In this position, the bead seats against all three walls of the retainer ring channel 34. The manner in which the retainer ring is thus forced over the bead will be described shortly. At this point, however, it should be noted that according to the preferred practice of the invention, the side walls 36 of the retainer ring 32 have a slight "draw" or taper approximately matching that of the outer side walls of bead 28. Further, the width of the channel 34, at its narrowest part, is just slightly less than the outer width of the bead 28. Accordingly, when the retainer ring 32 is forced over the bead 28, the side walls 38 of the bead are compressed between the side faces of the lens 12 and the side walls 36 of the ring, and the outer connecting wall 40 of the bead is compressed between the outer edge of the lens and the outer connecting wall 42 of the ring, thereby producing a highly effective fluid-tight seal between the lens 12 and the wall 24 of the face enclosure 16, about the entire perimeter of the lens. It is also apparent that the taper of the retainer ring side walls 36 facilitates assembly of the retainer ring over the bead 28.

Retainer ring 32 is split into two halves along a parting plane 44 about which the retainer ring is generally symmetrical. As will be seen shortly, the upper half 32a and the lower half 32b of the retainer ring are identical.

Lens 12 is somewhat elliptical in outline and is curved so that the left-hand extremity and the right-hand extremity of the lens, as the latter is viewed in FIGURE 1, curve rearwardly to increase the wearer's side vision. The bead 28 and the ring 32 of the retainer means 14 are curved to match the curvature of the lens. Accordingly, the upper half 32a of the retainer ring has a central portion 46 which extends across the front of the breathing mask 10 and extremities 48 and 50 which curve to the rear, around opposite sides of the mask, and then downwardly toward the parting plane 44. Similarly, the lower half 32b of the retainer ring has a central portion 46 which extends across the front of the breathing mask and extremities 48 and 50 which curve rearwardly around opposite sides of the mask and then upwardly toward the parting plane 44. The adjacent extremities of the two ring halves have confronting end faces 52 parallel to the parting plane 44.

Projecting rearwardly from the ends of each half of the retainer ring 32 are bosses or flanges 54. Extending through the opposing flanges of the upper and lower ring halves are aligned bores receiving bolts 56 having nuts 58 threaded thereon. The retainer ring flanges 54 are preferably counter-bored at 60 to receive the head, and polygonally recessed at 61 to receive the nut, of each bolt, whereby the bolt heads and nuts are obscured when the retainer ring is viewed from the side, as in FIGURE 2.

As will be explained shortly, when installing the lens 12 in the lens opening 26, the two halves 32a and 32b of the retainer ring 32 are drawn together, about the bead 28 and lens 12, by tightening the bolts 56. When thus clamping the retainer ring 32 about the lens 12, it is desirable, for several reasons, to maintain the two halves of the ring in precise alignment. Thus, the over-all appearance of the face mask, formed by the face enclosure 16, lens 12, and lens retaining means 14 is greatly enhanced if the two halves of the retainer ring are precisely aligned. Secondly, misalignment of the two halves of the retainer ring, when finally drawn tightly about the lens, might destroy the fluid-tight integrity of the seal between the lens and the face enclosure. Finally, unless the two halves of the retainer ring are precisely aligned as they are drawn together about the lens, the latter may be distorted or cracked.

To insure precise alignment of the two halves 32a and 32b of the retainer ring 32, the end 48 of each half of the ring is equipped with a locating pin 62 which projects beyond the adjacent end surface 52. The other end 50 of each half of the retainer ring is formed with a bore or socket 64 to slidably receive the adjacent locating pin 62. These locating pins and sockets are positioned to locate the two halves of the retainer ring in precise alignment. It is now evident that the two halves 32a and 32b of the retainer ring are identical and are merely turned end for end so that the end 48 of one half of the ring is located opposite the end 50 of the other half of the ring. As a result, the two halves of the retainer ring are interchangeable. This obviously facilitates assembly of the lens retaining means 14 since it is immaterial which half of the ring is placed at the top and which half of the ring is placed at the bottom. In addition, the use of a retainer ring composed of two identical halves simplifies initial manufacture of the ring as well as subsequent repair of the ring by replacing either half thereof.

When installing the lens 12 in the lens opening 26, the bolts 56 are loosened to permit separation of the two halves 32a and 32b of the retainer ring 32, in the manner illustrated in FIGURE 5. The bolts 56 and locating pins 62 are preferably so axially dimensioned as to enable sufficient separation of the ring halves, without removal of the bolts or disengagement of the locating pins from their sockets, to permit the lens to be removed from or a lens to be inserted into lens opening 26 with the edge of the lens engaging in the bead groove 30. When thus installing the lens, of course, it is necessary to stretch the bead over the edge of the lens. Bolts 56 are then retightened to draw the two halves 32a and 32b of the retainer ring 32 tightly about the edge of the lens. In so doing, an effective fluid-tight seal is formed between the lens and the wall 24 of the face enclosure 16, as described earlier in connection with FIGURE 3. It is to be noted that abutment of the confronting end faces 52 of the two ring halves, as shown in FIGURE 2, prevents excessive strain from being placed on the lens 12 by overtightening of the bolts 56. In actual practice, the confronting end faces 52 of the two ring halves may diverge slightly toward the front, as may be observed in FIGURE 2, because of the thrust of the compressed bead 28 against the two ring halves 32a and 32b, which are forwardly located relative to the bolts 56. The illustrated rearward extension of the flanges 54, however, is advantageous because it locates the flanges in a position which enhances the appearance of the mask and eliminates the possibility of these flanges becoming engaged in other parts of the user's equipment.

While in the foregoing specification, there has been described a presently preferred embodiment of the invention, the latter is not deemed to be limited to the precise details of construction thus disclosed by way of example. It should be understood, therefore, that the invention includes, as well, all such changes and modifications in the construction, combination and arrangement of parts as are encompassed within the spirit and scope of the following claims.

I claim:

1. A face mask comprising:

- a face enclosure having a lens opening and a resilient bead integral with the wall of said enclosure and encircling said opening,
- a transparent lens positioned within said opening, said bead having an inwardly opening groove receiving the peripheral edge of said lens, opposite inside and outside side walls of the bead having flat exterior surfaces of uninterrupted continuity,
- a split retainer ring encircling said bead and having an inwardly opening channel receiving the bead, said ring having side walls with smooth interior surfaces spaced apart a distance slightly less than the distance between said outside side walls of the bead,

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each half of said retainer ring having terminal flanges which extend rearwardly relative to said lens and in generally parallel relationship, and bolts extending through said flanges for drawing the two halves of said ring together about said bead and lens to firmly retain the latter in said opening. 5

2. A face mask comprising:
 a face enclosure having a lens opening and a resilient bead integral with the wall of said enclosure and encircling said opening, 10
 a transparent lens positioned within said opening, said bead having an inwardly opening groove receiving the peripheral edge of said lens and side walls having flat exterior surfaces, 15
 a split retainer ring encircling said bead and having an inwardly opening channel receiving the bead, side walls of said channel having each a length no greater than the length of the respective flat exterior surface of the side wall of the bead, 20
 means for drawing the two halves of the ring together about said bead and lens to firmly retain the latter in said opening, 25
 said channel and bead being tapered in transverse cross-section, whereby the material of said bead is compressed between the walls of said channel and said lens to form a fluid-tight seal between the latter and said enclosure wall.

3. In a smoke and oxygen mask having a face enclosure with a forward lens opening and including a lower breathing chamber, a supply hose connecting to said chamber, and a lens positioned in said opening, the improvements comprising retaining means for retaining said lens in said opening including:
 a resilient bead integral with the wall of said enclosure and encircling said opening, 35
 said bead having an inwardly opening groove receiving the peripheral edge of said lens, 40
 a split retainer ring encircling said bead and having an inwardly opening channel receiving the bead, each half of said retainer ring having terminal flanges extending rearwardly along opposite sides of said face enclosure, 45
 bolts extending through the flanges on adjacent ends of said ring halves at locations displaced rearwardly relative to the bead for drawing the ring halves together about said bead and lens to firmly retain the latter in said opening, 50
 a locating pin in fore and aft alignment with the respective bolt and the adjacent edge of the lens, said locating pin projecting from one end face of each ring half, and into a socket in the adjacent end of the other ring half receiving said locating pin for maintaining said ring halves in alignment as they are drawn together, 55
 said ring halves being identical, and
 said bead and channel being tapered and the width of said bead being slightly greater than the width of said channel whereby said bead is compressed be-

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tween the walls of said channel and said lens to form a fluid-tight seal between the lens and the wall of said enclosure.

4. The subject matter of claim 3 wherein:
 said lens is elongated laterally of said mask and the ends of said lens and the ends of said ring halves curve rearwardly to increase the side vision of the wearer.

5. A face mask comprising:
 a face enclosure having a lens opening and a resilient bead integral with the wall of said enclosure and encircling said opening, 10
 a transparent lens positioned within said opening, said bead having an inwardly opening groove receiving the peripheral edge of said lens, said bead having side walls of substantially uniform thickness with flat exterior surfaces extending uninterruptedly from one edge to the other, 15
 a split retainer ring encircling said bead and having an inwardly opening channel receiving the bead, side walls of said channel having flat interior surfaces no greater in breadth than the breadth of said exterior surfaces of the sidewalls of the bead whereby to provide a surface to surface engagement throughout said surfaces, 20
 each half of said retainer ring having terminal flanges extending rearwardly along opposite sides of said face enclosure, 25
 bolts extending through the flanges on adjacent ends of said ring halves for drawing the latter together about said bead and lens to firmly retain the latter in said opening, 30
 a locating pin projecting from one end face of each ring half into a socket in the adjacent end of the other ring half for maintaining said ring halves in alignment as they are drawn together, 35
 said ring halves being identical, and
 said bead and channel being tapered and the width of said bead being slightly greater than the width of said channel whereby said bead is compressed between the walls of said channel and said lens to form a fluid-tight seal between the lens and the wall of said enclosure. 40

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